No easy solution to genetic 'battle of the sexes'

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These are two male broad-horned flour beetles locked in battle. Credit: Dr. Kensuke Okada

A new study published today shows a genetic 'battle of the sexes' could be much harder to resolve and even more important to evolution than previously thought.

This battle, observed across many species and known as intralocus sexual conflict, happens when the genes for a trait which is good for the breeding success of one sex are bad for the other – sparking an 'evolutionary tug-o-war' between the sexes.

It has previously been thought these issues were only resolved when the trait in question evolves to become sex-specific in its development –

meaning the trait only develops in the gender it benefits and stops affecting the other. An example of this is male peacocks' tails, used for mating displays, which are not present in females.

However, a new study by the universities of Exeter (UK), Okayama and Kyushu (both Japan) published today [4 November] in *Current Biology* shows this doesn't always bring an end to conflict – as even when the trait becomes sex-specific, knock-on effects can still disadvantage the other sex.

Professor Dave Hosken, from the Centre for Ecology & Conservation (Cornwall) at the University of Exeter, said: "This kind of genetic tussle is everywhere in biology. For example, in humans, male hips are optimised for physical activity, whereas female hips also need to allow child bearing. That's the sort of evolutionary conflict we're talking about, and these conflicts were previously thought to be resolved by sex-specific trait development.

This is a male broad-horned flour beetle. Credit: Dr. Kensuke Okada

"What we're seeing in this study is that this isn't always the end of the sexual conflict. This means it's no longer clear how or when, if ever, these conflicts get fully resolved and this means it could be more important to the evolutionary process than has generally been thought."

In this study, the researchers looked at broad-horned flour beetles, where males have massively enlarged mandibles used to fight other males for mating supremacy. The enlarged mandibles aren't present in the females at all – meaning this is a sex-specific trait.

By selectively breeding the beetles for larger or smaller mandible size, the researchers were able to show that the bigger the mandibles were – the more successful the males were in breeding. There was a corresponding counter-effect on females, however, as females from larger mandibled populations were less successful.

Professor Takahisa Miyatake, from the Graduate School of Environmental Science at Okayama University, said: "We looked at all the possible reasons for this and found that while the females did not develop the larger mandibles, they did inherit many of the other characteristics that made the enlarged mandibles possible in males. This included a reduced abdomen size, which could affect the number of eggs a female can carry – giving a possible explanation for the disadvantage.

This is a female broad-horned flour beetle. Credit: Dr. Kensuke Okada

"So here we see a sex-specific trait which is still having a negative effect on the sex which doesn't show it. This means that even though it looks like this genetic conflict is over, it's still ongoing and there's no easy way to end it."

Kensuke Okada, also from Okayama University, said: "The view that sex-limited trait development resolves this kind of genetic battle of the sexes is based on the assumption that traits are genetically independent of each other, which is frequently not true.

"What we're seeing here is that genetic architecture can provide a general barrier to this kind of conflict resolution."

Provided by University of Exeter

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